National Institute of Environmental Health Sciences

Shifting patterns: Malaria dynamics and rainfall variability in an African highland

Author(s): Pascual M, Cazelles B, Bouma MJ, Chaves LF, Koelle K
Year: 2008
Journal: Proceedings. Biological Sciences / The Royal Society. 275 (1631): 123-132

Abstract:

The long-term patterns of malaria in the East African highlands typically involve not only a general upward trend in cases but also a dramatic increase in the size of epidemic outbreaks. The role of climate variability in driving epidemic cycles at interannual time scales remains controversial, in part because it has been seen as conflicting with the alternative explanation of purely endogenous cycles exclusively generated by the nonlinear dynamics of the disease. We analyse a long temporal record of monthly cases from 1970 to 2003 in a highland of western Kenya with both a time-series epidemiological model (time-series susceptible-infected-recovered) and a statistical approach specifically developed for non-stationary patterns. Results show that multiyear cycles of malaria outbreaks appear in the 1980s, concomitant with the timing of a regime shift in the dynamics of cases; the cycles become more pronounced in the 1990s, when the coupling between disease and rainfall is also stronger as the variance of rainfall increased at the frequencies of coupling. Disease dynamics and climate forcing play complementary and interacting roles at different temporal scales. Thus, these mechanisms should not be viewed as alternative and their interaction needs to be integrated in the development of future predictive models.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2596179

Resource Description

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Precipitation

Geographic Feature:

resource focuses on specific type of geography

Other Geographical Feature

Other Geographical Feature : highlands

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Africa

African Region/Country: African Country

Other African Country: Kenya

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content